

TABLE 2.—*Tabulated data of sounding-balloon ascents made at Broken Arrow, Okla., during December, 1929—Continued*

DECEMBER 29, 1929

Time 90th mer.	Altitude (M. S. L.)	Pressure	Temperature ° C.	$\Delta t$ 100 m.	Humidity		Wind		Remarks
					Relative	Vapor pres- sure	Direction	Velocity	
P. m.	M.	Mb.	° C.		P. c.	Mb.		M. p. s.	
3:44	233	991.9	16.6	-----	32	6.05	sw.	8.8	Cloudless.
	800	961.1	14.6	-----	32	5.32	ws.	8.8	
3:47	928	913.3	11.5	0.73	32	4.34	ws.	10.6	
	1,000	905.4	11.0	-----	32	4.20	ws.	11.3	
3:49	1,490	853.5	7.8	0.66	32	3.39	w.	19.0	
	1,500	852.5	7.8	-----	32	3.39	w.	19.0	
	2,000	802.3	6.9	-----	30	2.98	wnw.	17.5	
3:52	2,122	790.4	6.7	0.17	30	2.94	wnw.	16.9	
	2,500	754.7	4.9	-----	31	2.63	wnw.	16.2	
	3,000	709.7	2.4	-----	32	2.32	nw.	14.1	
3:59	3,711	649.9	-1.0	0.48	34	1.91	nw.	17.0	
	4,000	626.7	-2.5	-----	34	1.69	nw.	19.3	
	5,000	551.9	-7.7	-----	35	1.12	wnw.	20.8	
4:04	5,025	550.2	-7.8	0.52	35	1.11	wnw.	20.8	
	6,000	484.3	-18.2	-----	32	0.48	nw.	18.8	
4:11	6,628	446.0	-21.6	0.86	30	0.27	nnw.	23.2	
	7,000	423.8	-25.0	-----	30	0.19	nnw.	25.0	
4:15	7,728	383.1	-31.8	0.93	30	0.10	nw.	22.5	
	8,000	369.0	-33.7	-----	30	0.08	nw.	21.2	
	9,000	320.1	-40.9	-----	29	0.03	n.	26.6	
4:22	9,686	289.7	-45.8	0.66	28	0.02	n.	30.0	Tropopause.
	10,000	276.8	-46.9	-----	28	0.02	nnw.	23.1	
4:24	10,339	262.8	-46.0	0.03	28	0.02	nw.	19.8	
	11,000	238.5	-48.0	-----	27	0.01	nw.	29.6	
	12,000	205.6	-50.9	-----	26	0.01	nw.	34.6	
4:31	12,828	181.0	-53.4	0.30	25	0.01	nnw.	20.1	
	13,000	176.5	-54.0	-----	25	0.01	nnw.	23.6	
	14,000	151.4	-57.5	-----	25	(1)	nw.	20.2	
	15,000	129.5	-61.1	-----	25	(1)	nw.	20.0	
4:42	15,738	115.4	-63.7	0.35	25	(1)	nnw.	17.6	
	16,000	110.7	-63.8	-----	25	(1)	nnw.	13.3	
	17,000	94.4	-64.0	-----	25	(1)	nnw.	11.8	
4:50	17,555	86.4	-64.1	0.02	25	(1)	nw.	14.6	
	18,000	80.5	-63.4	-----	25	(1)	nnw.	14.4	
4:54	18,550	73.6	-62.6	-0.15	25	(1)	nw.	20.2	

1 Less than 0.01 mb.

## LITERATURE CITED

- (1) Annals Harvard College Observatory, Vol. 68, Pt. 1
- (2) Monthly Weather Review, June 1929, pp. 231-246.
- (3) Monthly Weather Review, July 1927, pp. 293-307.

## THE WEATHER AND RADIO

By W. J. HUMPHREYS

It appears to be human nature to explain whatsoever is not understood by attributing it to something that is still more mysterious, or even to the supernatural. At any rate this is a very common human practice, as excellently illustrated by the many appeals that have come to the Weather Bureau to have radio broadcasting suppressed, on the ground that it is burning up the water vapor of the air and thereby, or in some other manner, greatly decreasing the amount of rainfall, and thus causing disastrous droughts.

On the other hand, some who were bothered with more rain than needed were equally insistent that radio is the cause of excessive precipitation and floods, and urged that therefore all wireless communication be forthwith and preemptorily forbidden.

Let us analyze somewhat nature's way of making rain, and from that see, if we can, just how and to what extent radio does affect precipitation.

1. The first action necessary to precipitation is evaporation, by which water in the gaseous form is gotten into and made a portion of the atmosphere. Now the chief factors that affect the rate of evaporation are: (a) Temperature of the evaporating water; (b) area of the evaporating surface; (c) wind velocity; (d) dryness of the air.

## WIND VELOCITIES AT DIFFERENT HEIGHTS ABOVE GROUND

By C. F. MARVIN

A correspondent inquires whether the Weather Bureau has made any investigations to determine the relative wind velocity as indicated by an anemometer at different heights above ground. The following reply was made:

Replying to your telegram of August 21, requesting information as to velocities indicated by anemometers at different heights above the ground, you are advised that the Weather Bureau has conducted a number of inconclusive comparisons of wind velocities measured at its stations at different elevations, with the hope that some rational rule would result for coordinating the indications at various heights. Thus far, however, we have not felt justified in announcing any such coordination or formula, so to speak, for reduction to uniform elevations.

The demands upon the bureau for service to the public in great metropolitan and other city areas compel us to occupy quarters such as can be procured in these cities. It is recognized that the wind-velocity records obtained under these conditions are not entirely satisfactory. If one contemplates the skyline of the modern great city, it is obvious that the flow of air over the house tops and among the skyscrapers is turbulent and difficult to measure with any specially significant result. On the other hand, observations made in the open country or in cities of moderate population necessarily represent only those localities, and can not, with assurance, be applied to other localities. Our policy, therefore, has been to submit records as obtained, without attempting to modify or adjust these records, and to supply to any interested person a complete description of the environment and nature of exposure of the anemometer at the particular station, leaving it to the user of the records to make such correlations with environment as may seem to him to be best.

Apart from the foregoing, you are further advised that various comparative observations have been made for winds at different altitudes over an open plain or country, and one formula for increase of velocity is approximately

$$V = V_0 \left( \frac{h}{h_0} \right)^{\frac{1}{5}}$$

where  $h$  is the height in meters above the surface for which the velocity  $V$  in meters per second is to be computed, and  $h_0$ , the known height (not less than 16 meters) at which the velocity  $V_0$  is measured. There are still other relations that cover the general increase in velocity upward for much greater elevations. I infer, however, that you are interested only in elevations of several hundred feet above the actual surface.

Of course no one in the neighborhood of a powerful "sending station" ever claims that any lake, reservoir or other body of water near-by, spreads over a lot more ground when the station is in operation than it does when the station is silent. He knows, too, that the temperature of the water does not appreciably vary, if at all, with the wireless activity. Neither, so far as any one can observe, does the wind round about a wireless station change with the amount of its broadcasting or receiving. We shall see presently, too, that radio does not alter the dryness of the air.

Obviously, since radio does not affect any of the things that themselves make for evaporation, neither does it affect evaporation itself.

2. The next step by nature in producing rain is to condense the water vapor out of the air in the form of drops. To this end two things are necessary: (a) One of these is the presence of condensation nuclei, that is, excessively small particles of sea salt, certain kinds of land dust, or other substances that readily take up water vapor. These nuclei about which cloud droplets form always are in the atmosphere in superabundance. Besides, they are not produced by wireless waves, as we know by direct experiment. (b) The other essential to